WHAT IS CLAIMED IS:

1. A magnetic sensor comprising:

a multilayer film having a first antiferromagnetic layer, a fixed magnetic layer, a nonmagnetic material layer, and a free magnetic layer in that order from the bottom; and

second antiferromagnetic layers provided on two side portions of the free magnetic layer in a track width direction, wherein back end surfaces of the second antiferromagnetic layers in a height direction, which are in regions in which exchange coupled magnetic fields are generated, are each located at least at a position closer to a face opposing a recording medium than a back end surface of a central portion of the free magnetic layer in the height direction, the central portion being located between the two side portions.

2. The magnetic sensor according to Claim 1, wherein a third antiferromagnetic layer is provided on the free magnetic layer, thereby the second antiferromagnetic layers being on the two side portions of the third antiferromagnetic layer in the track width direction.

3. A magnetic sensor comprising:

a multilayer film having a first antiferromagnetic layer, a fixed magnetic layer, a nonmagnetic material layer, and a free magnetic layer in that order from the bottom;

an insulating layer extending on at least two side

portions in a width direction of the free magnetic layer in a back region along a height direction; and

second antiferromagnetic layers provided on the two side portions from a face opposing a recording medium to the insulating layer.

4. The magnetic sensor according to Claim 3, wherein a third antiferromagnetic layer is provided on the free magnetic layer,

thereby the insulating layer extending on the two side portions of the third antiferromagnetic layer in the back region along the height direction, and

the second antiferromagnetic layers being on the two side portions of the third antiferromagnetic layer from the face opposing a recording medium to the insulating layer.

5. The magnetic sensor according to Claim 3, wherein the insulating layer is formed to extend in the height direction further from a back end surface of the multilayer film in the height direction.

6. The magnetic sensor according to Claim 2, wherein a nonmagnetic layer is provided between the free magnetic layer and the insulating layer in the thickness direction or between a third antiferromagnetic layer and the insulating layer.

7. The magnetic sensor according to Claim 6, wherein

the nonmagnetic layer comprises at least one element selected from the group consisting of Ru, Re, Pd, Os, Ir, Pt, Au, Rh, and Cr.

8. The magnetic sensor according to Claim 2, wherein the third antiferromagnetic layer is formed so as to have a thickness of 20 to 50 Å.

9. A method for manufacturing a magnetic sensor, comprising the steps of;

(a) forming a multilayer film composed of a first antiferromagnetic layer, a fixed magnetic layer, a nonmagnetic material layer, and a free magnetic layer in that order from the bottom;

(b) providing an insulating layer on two side portions in a track width direction of the free magnetic layer in a back region along a height direction; and

(c) forming second antiferromagnetic layers on the two side portions of the free magnetic layer from a face opposing a recording medium to the insulating layer.

10. A method for manufacturing a magnetic sensor, comprising the steps of;

(d) forming a multilayer film composed of a first antiferromagnetic layer, a fixed magnetic layer, a nonmagnetic material layer, a free magnetic layer, a third antiferromagnetic layer, and a nonmagnetic layer in that order from the bottom;

(e) forming a back end surface of the multilayer film in a height direction into a predetermined shape;

(f) forming an insulating layer on the multilayer film in a back region in the height direction and in a region extending further from the back end surface in the height direction;

(g) grinding an exposed part of the nonmagnetic layer, which is not provided with the insulating layer thereon;

(h) forming a solid second antiferromagnetic layer over the third antiferromagnetic layer and the insulating layer; and

(i) forming mask layers on the solid second antiferromagnetic layer at positions which correspond to two side portions of the third antiferromagnetic layer in a track width direction, followed by grinding a central portion of the solid second antiferromagnetic layer in a track width direction, which is not covered with the mask layers, so as to form second antiferromagnetic layers on the two side portions from a face opposing a recording medium to the insulating layer provided on the third antiferromagnetic layer in the back region in the height direction.

11. The method for manufacturing a magnetic sensor, according to Claim 10, wherein the nonmagnetic layer comprises at least one element selected from the group consisting of Ru, Re, Pd, Os, Ir, Pt, Au, Rh, and Cr.

12. The method for manufacturing a magnetic sensor,

according to Claim 11, wherein the nonmagnetic layer has a thickness of 3 to 10 Å in a film forming step.

13. The method for manufacturing a magnetic sensor, according to Claim 10, wherein the third antiferromagnetic layer is formed so as to have a thickness of 20 to 50 Å.